

# Claims

[c1] What is claimed is:

1.A method to qualify a line pair, comprising:

sending an initiate test signal to a termination unit; and  
performing a series of line pair qualifying tests, wherein  
the termination unit is adapted to provide selected types  
of terminations connectable to the line pair to perform  
the qualifying tests.

[c2] 2.The method of claim 1, wherein performing the series  
of line tests comprises:

open circuiting the line pair for a predetermined time  
period or in response to receiving a predetermined sig-  
nal; and

performing open circuit line tests while the line pair is  
open circuited by the termination unit.

[c3] 3.The method of claim 2, wherein performing the open  
circuit line tests comprises performing at least time do-  
main reflectometer tests, a signal leakage test, capacitive  
measurements, noise tests, a foreign voltage presence  
test, and an insulation resistance test.

[c4] 4.The method of claim 1, wherein performing the series

of line tests comprises:

short circuiting the line pair for a predetermined time period or in response to receiving a predetermined signal; and

performing short circuit line tests while the line pair is short circuited by the termination unit.

[c5] 5.The method of claim 4, wherein performing the short circuit line test comprises performing at least a loop resistance measurement, ambient noise measurement, and a resistive balance test.

[c6] 6.The method of claim 1, wherein performing the series of line tests comprises:  
transmitting a selected signal on the line pair for a predetermined time period or in response to receiving a predetermined signal; and  
performing signal loop tests while the selected signal is transmitted on the line pair by the termination unit.

[c7] 7.The method of claim 6, wherein performing the signal loop tests comprises performing at least a signal attenuation test, a signal spectral shape test, and a longitudinal balance test.

[c8] 8.The method of claim 1, wherein sending the initiate test signal comprises sending the signal to the termina-

tion unit over a digital subscriber line (xDSL) link.

- [c9] 9.The method of claim 1, wherein sending the initiate test signal comprises sending the signal over an embedded operations channel (EOC).
- [c10] 10.The method of claim 1, wherein sending the initiate test signal comprises sending the signal from a remote termination unit to the termination unit.
- [c11] 11.The method of claim 10, further comprising coupling a test set adapted to perform copper qualifying line testing to the remote termination unit to send the initiate test signal.
- [c12] 12.The method of claim 11, further comprising:  
disconnecting the remote termination unit from the line pair; and  
connecting the test set directly to the line pair before performing the series of line qualifying tests.
- [c13] 13.The method of claim 10, further comprising coupling a test set adapted to perform copper qualifying line testing to the remote termination unit by a video terminal 100 (VT100) connection.
- [c14] 14.The method of claim 1, further comprising:  
disconnecting a remote termination unit from the line

pair, if installed; and  
connecting a test set adapted to perform copper qualifying line testing and equipped with an x digital subscriber line (xDSL) type modem to the line pair.

- [c15] 15.The method of claim 14, wherein the xDSL type modem is integrated into the test set.
- [c16] 16.The method of claim 14, wherein sending the initiate test signal comprises sending the signal to the termination unit via a non-xDSL type communication link.
- [c17] 17.The method of claim 14, wherein sending the initiate test signal comprises sending the signal to the termination unit over the line pair.
- [c18] 18.The method of claim 1, further comprising removing battery from the line pair before performing the series of line pair qualifying tests.
- [c19] 19.The method of claim 1, further comprising establishing an xDSL link in response to the line pair passing the series of line pair qualifying tests.
- [c20] 20.A method to qualify a line pair, comprising:  
coupling a test set adapted to perform a series of qualification tests to a line pair; and  
using a terminating unit (HTU) as a far-end device to

perform the series of qualification tests in coordination with the test set.

[c21] 21.The method of claim 20, further comprising sending an initiate test signal to the HTU, wherein the HTU is adapted to provide selected types of terminations connectable to the line pair in response to receiving the initiate test signal.

[c22] 22.The method of claim 21, wherein sending the initiate test signal comprises sending the signal to the HTU over an x digital subscribe line (xDSL) link.

[c23] 23.The method of claim 21, wherein sending the initiate test signal comprises sending the signal over an embedded operations channel (EOC).

[c24] 24.The method of claim 21, wherein the HTU is a central office termination unit and wherein sending the initiate test signal comprises:

connecting the test set to a remote termination unit

(HTU-R) to send the initiate test signal to the (HTU-C);

and wherein the method further includes:

disconnecting the HTU-R from the line pair after sending the initiate test signal; and

connecting the test set directly to the line pair after disconnecting the HTU-R and before performing the series

of line qualifying tests.

- [c25] 25.The method of claim 21, wherein the test set is coupled to a subscriber end of the line pair by an xDSL type modem to send the initiate test signal.
- [c26] 26.The method of claim 21, wherein sending the initiate test signal comprises sending the signal to the HTU via a non-xDSL communication link.
- [c27] 27.The method of claim 20, wherein using the HTU comprises:  
selectively open circuiting the line pair for a predetermined time period or in response to receiving a predetermined signal; and  
performing open circuit line test on the line pair while the line pair is open circuited by the HTU.
- [c28] 28.The method of claim 20, wherein using the HTU comprises:  
selectively short circuiting the line pair for a predetermined time period or in response to receiving a predetermined signal; and  
performing short circuit line tests while the line pair is short circuited by the HTU.
- [c29] 29.The method of claim 20, wherein using the HTU comprises:

selectively transmitting a selected signal on the line pair for a predetermined time period or in response to receiving a predetermined signal; and performing signal loop test while the selected signal is transmitted on the line pair by the HTU.

[c30] 30.The method of claim 20, wherein the HTU is a remote termination unit (HTU-R) at a subscriber end of the line pair and wherein the test set is coupled to the line pair at a central office.

[c31] 31.A method to qualify a line pair, comprising:  
coupling a far end device to the line pair to perform selected line qualification tests; and  
coupling a termination unit to the line pair by the far end device to perform other selected line qualification test.

[c32] 32.The method of claim 31, further comprising transmitting signals from a test set to control operating of the far end device to connect the termination unit to the line pair.

[c33] 33.The method of claim 31, further comprising transmitting signals from a test set to control operation of the far end device and the termination unit to perform different line qualification tests.

[c34] 34.The method of claim 31, further comprising coupling

the line pair to a common ground to perform resistive balance testing of the line pair.

[c35] 35.The method of claim 34, further comprising operating input relays of the termination unit to connect the line pair to the common ground.

[c36] 36.The method of claim 35, wherein the input relays are operated in response to a signal from a test set.

[c37] 37.A system to qualify a line pair, comprising:  
a test set adapted to perform a series of qualification tests on the line pair; and  
a terminating unit (HTU) adapted to selectively provide different types of terminations connectable to the line pair to perform the series of qualifying tests on the line pair.

[c38] 38.The system of claim 37, wherein the HTU is adapted to selectively connect an open circuit to the line pair for a predetermined time period or in response to receiving a predetermined signal and the test set is adapted to perform a plurality of open circuit tests while the line pair is open circuited by the HTU.

[c39] 39.The system of claim 38, wherein the plurality of open circuit tests comprises time domain reflectometer tests, a signal leakage test, capacitive measurements, noise



tests, a foreign voltage presence test, and an insulation resistance test.

- [c40] 40. The system of claim 37, wherein the HTU is adapted to selectively connect a short circuit to the line pair for a predetermined time period or in response to a predetermined signal and the test set is adapted to perform a plurality of short circuit tests while the line pair is short circuited by the HTU-C.
- [c41] 41. The system of claim 40, wherein the plurality of short circuit tests comprises a loop resistance measurement, ambient noise measurement, and a resistive balance test.
- [c42] 42. The system of claim 37, wherein the HTU is adapted to selectively connect a selected signal for transmission on the line pair and the test set is adapted to perform a plurality of signal loop tests while the selected signal is being transmitted on the line pair.
- [c43] 43. The system of claim 42, wherein the signal loop tests comprise a signal attenuation test, a signal spectral shape test, and a longitudinal balance test.
- [c44] 44. The system of claim 37, further comprising an initiate test signal, wherein the HTU selectively connects the different types of terminations to the line pair in response to receiving the initiate test signal.

- [c45] 45.The system of claim 44, wherein the initiate test signal is sent over an x digital subscriber line (xDSL) link to the HTU.
- [c46] 46.The system of claim 44, wherein the HTU is a central office termination unit (HTU-C), and wherein the system further comprises a remote termination unit (HTU-R), wherein the test set is connectable to the HTU-R to send the initiate test signal to the HTU-C.
- [c47] 47.The system of claim 46, further comprising a VT100 connection to connect the test set to the HTU-R.
- [c48] 48.The system of claim 44, wherein the initiate test signal is sent over an embedded operations channel (EOC).
- [c49] 49.The system of claim 44, wherein the initiate test signal is sent via a non-xDSL type communication link.
- [c50] 50.The system of claim 49, wherein the initiate test signal is sent over the line pair.
- [c51] 51.The system of claim 37, further comprising an xDSL type modem connectable between the test set and the line pair.
- [c52] 52.The system of claim 51, wherein the xDSL type modem is integrated into the test set.

- [c53] 53.The system of claim 37, wherein the HTU comprises a microprocessor adapted to control operation of the HTU to perform the qualification tests.
- [c54] 54.The system of claim 37, wherein the HTU is a remote HTU (HTU-R) at a subscriber end of the line pair.
- [c55] 55.The system of claim 37, wherein the HTU is a central office HTU (HTU-C) at a central office end of the line pair.
- [c56] 56.A system to qualify a line pair, comprising:  
a far end device to perform line qualification tests; and  
a termination unit, wherein the far end device is adapted to connect the termination unit to the line pair to perform the line qualifications tests.
- [c57] 57.The system of claim 56, further comprising a test set, wherein the far end device connects the termination unit to the line pair in response to a signal from the test set.
- [c58] 58.The system of claim 56, further comprising a test set to control operation of the far end device and the termination unit and to perform the line qualification tests.
- [c59] 59.The system of claim 56, further comprising a common ground connectable to the line pair to perform resistive balance testing.

- [c60] 60.The system of claim 59, wherein the termination unit comprises input relays, wherein the input relays are operable to connect the line pair to the common ground.
- [c61] 61.The system of claim 60, further comprising a test set, wherein the input relays are operable in response to a signal from the test set.
- [c62] 62.A termination unit (HTU), comprising:  
a set of switches; and  
a microprocessor to operate the switches to selectively connect different types of terminations to a line pair to perform qualifying tests on the line pair.
- [c63] 63.The HTU of claim 62, wherein the microprocessor is adapted to operate the switches to open circuit the line pair for a predetermined time period for open circuit line qualifying tests to be performed.
- [c64] 64.The HTU of claim 62, further comprising a transformer, wherein the microprocessor is adapted to operate the switches to connect the line pair to the transformer for a predetermined time period for short circuit line qualifying tests to be performed on the line pair.
- [c65] 65.The HTU of claim 62, further comprising a source to provide a selected signal, wherein the microprocessor is

adapted to operate the switches to couple the line pair to the source of the selected signal for a predetermined time period for signal loop line qualifying tests to be performed on the line pair.

[c66] 66.The HTU of claim 62, wherein the microprocessor operates the switches to selectively connect different types of terminations to the line pair in response to receiving an initiate test signal.

[c67] 67.The HTU of claim 62, wherein the microprocessor operates the switches to selectively switch from one termination to another in response to receiving a predetermined signal over the line pair.

[c68] 68.The HTU of claim 62, wherein the HTU is a central office termination unit (HTU-C).

[c69] 69.The HTU of claim 62, wherein the HTU is a remote termination unit (HTU-R).

[c70] 70.A test set to qualify a line pair, comprising:  
a microprocessor to perform line qualifying tests; and  
an xDSL type modem to signal a termination unit (HTU) to selectively connect different types of terminations to the line pair to perform the line qualifying tests.

[c71] 71.The test set of claim 70, further comprising a mem-

ory to store results of the line qualification tests.

[c72] 72.The test set of claim 70, wherein the xDSL modem is adapted to signal the HTU to connect one of an open circuit, a short circuit or a selected signal to the line pair for line qualification tests.

[c73] 73.A method of making an HTU, comprising:  
providing a microprocessor; and  
providing instructions executable by the microprocessor to perform line qualification tests on a line pair.

[c74] 74.The method of claim 73, further comprising providing a set of switches operable by the microprocessor in response to the instructions to couple different types of terminations to the line pair for qualification testing.

[c75] 75.The method of claim 73, wherein providing the instructions comprises providing instructions to connect the line pair to an open circuit for open circuit line qualifying tests to be performed.

[c76] 76.The method of claim 73, wherein providing the instructions comprises providing instructions to connect the line pair to a short circuit for short circuit line qualifying tests to be performed.

[c77] 77.The method of claim 73, wherein providing instruc-

tions comprises providing instructions to connect the line pair to a selected signal for signal loop line qualifying tests to be performed.

- [c78] 78.A method of making a test set, comprising:  
providing a microprocessor to perform line qualifying tests; and  
providing an xDSL type modem to signal a termination unit (HTU) to selectively connect different types of terminations to the line pair to perform the line qualifying tests.
- [c79] 79.The method of claim 78, further comprising providing a memory to store results of the line qualification tests.
- [c80] 80.The method of claim 78, further comprising adapting the xDSL type modem to signal the HTU to connect one of an open circuit, a short circuit or a selected signal to the line pair for line the qualifying tests.